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# 1 Bidirectional reflection functions from surface bump maps

**Brian Cabral, Nelson Max, Rebecca Springmeyer**

August 1987 **ACM SIGGRAPH Computer Graphics , Proceedings of the 14th annual conference on Computer graphics and interactive techniques**, Volume 21 Issue

4

Full text available:  pdf(1.65 MB)

[Additional Information: full citation, abstract, references, citings, index terms](#)

The Torrance-Sparrow model for calculating bidirectional reflection functions contains a geometrical attenuation factor to account for shadowing and occlusions in a hypothetical distribution of grooves on a rough surface. Using an efficient table-based method for determining the shadows and occlusions, we calculate the geometric attenuation factor for surfaces defined by a specific table of bump heights. Diffuse and glossy specular reflection of the environment can be handled in a unified manner ...

## 2 IMEM: an intelligent memory for bump- and reflection-mapping

## Anders Kugler

August 1998 **Proceedings of the ACM SIGGRAPH/EUROGRAPHICS workshop on Graphics hardware**

Full text available:  pdf(1.36 MB)

**Additional Information:** full citation, references, citings, index terms

**Keywords:** logic-embedded memory architectures, reflection- and bump-mapping

### 3 Towards real-time photorealistic rendering: challenges and solutions

## Andreas Schilling

August 1997 **Proceedings of the ACM SIGGRAPH/EUROGRAPHICS workshop on Graphics hardware**

Full text available:  pdf(962.20 KB)


**Additional Information:** full citation, references, citings, index terms

**Keywords:** anisotropic filtering, antialiasing, bump mapping, environment mapping

#### 4 The digital Michelangelo project: 3D scanning of large statues

Marc Levoy, Kari Pulli, Brian Curless, Szymon Rusinkiewicz, David Koller, Lucas Pereira, Matt

Ginzton, Sean Anderson, James Davis, Jeremy Ginsberg, Jonathan Shade, Duane Fulk  
 July 2000 **Proceedings of the 27th annual conference on Computer graphics and interactive techniques**


Full text available:  pdf(10.83 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We describe a hardware and software system for digitizing the shape and color of large fragile objects under non-laboratory conditions. Our system employs laser triangulation rangefinders, laser time-of-flight rangefinders, digital still cameras, and a suite of software for acquiring, aligning, merging, and viewing scanned data. As a demonstration of this system, we digitized 10 statues by Michelangelo, including the well-known figure of David, two building interiors, and all 1,163 extant f ...

**Keywords:** 3D scanning, cultural heritage, graphics systems, mesh generation, range images, rangefinding, reflectance and shading models, sensor fusion

##### 5 Light field mapping: efficient representation and hardware rendering of surface light fields

Wei-Chao Chen, Jean-Yves Bouguet, Michael H. Chu, Radek Grzeszczuk  
 July 2002 **ACM Transactions on Graphics (TOG) , Proceedings of the 29th annual conference on Computer graphics and interactive techniques**, Volume 21 Issue 3


Full text available:  pdf(7.79 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A light field parameterized on the surface offers a natural and intuitive description of the view-dependent appearance of scenes with complex reflectance properties. To enable the use of surface light fields in real-time rendering we develop a compact representation suitable for an accelerated graphics pipeline. We propose to approximate the light field data by partitioning it over elementary surface primitives and factorizing each part into a small set of lower-dimensional functions. We show th ...

**Keywords:** compression algorithms, image-based rendering, rendering hardware, texture mapping

##### 6 Image-based reconstruction of spatial appearance and geometric detail

Hendrik P. A. Lensch, Jan Kautz, Michael Goesele, Wolfgang Heidrich, Hans-Peter Seidel  
 April 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 2



Full text available:  pdf(302.22 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Real-world objects are usually composed of a number of different materials that often show subtle changes even within a single material. Photorealistic rendering of such objects requires accurate measurements of the reflection properties of each material, as well as the spatially varying effects. We present an image-based measuring method that robustly detects the different materials of real objects and fits an average bidirectional reflectance distribution function (BRDF) to each of them. In or ...

**Keywords:** BRDF measurement, normal map acquisition, photometric stereo, shape from shading, spatially varying BRDFs

##### 7 Reflection vector shading hardware

Douglas Voorhies, Jim Foran  
 July 1994 **Proceedings of the 21st annual conference on Computer graphics and interactive techniques**


Full text available:  pdf(126.98 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)  
 ps(1.27 MB)

Surface reflections of an environment can be rendered in real time if hardware calculates an unnormalized reflection vector at each pixel. Conventional perspective-correct texture hardware can then be leveraged to draw high-quality reflections of an environment or specular highlights in real time. This fully accommodates area light sources, allows a local viewer to move interactively, and is especially well suited to the inspection of surface orientation and curvature. By emphasizing the ri ...

## 8 [Homomorphic factorization of BRDFs for high-performance rendering](#)

Michael D. McCool, Jason Ang, Anis Ahmad

August 2001 **Proceedings of the 28th annual conference on Computer graphics and interactive techniques**

Full text available:  pdf(2.33 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


*A bidirectional reflectance distribution function (BRDF) describes how a material reflects light from its surface. To use arbitrary BRDFs in real-time rendering, a compression technique must be used to represent BRDFs using the available texture-mapping and computational capabilities of an accelerated graphics pipeline. We present a numerical technique, homomorphic factorization, that can decompose arbitrary BRDFs into products of two or more factors of lower dimensionality, each factor de ...*

**Keywords:** hardware accelerated rendering and shading

## 9 [Procedural modeling of cities](#)

Yoav I. H. Parish, Pascal Müller

August 2001 **Proceedings of the 28th annual conference on Computer graphics and interactive techniques**

Full text available:  pdf(1.04 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Modeling a city poses a number of problems to computer graphics. Every urban area has a transportation network that follows population and environmental influences, and often a superimposed pattern plan. The buildings appearances follow historical, aesthetic and statutory rules. To create a virtual city, a roadmap has to be designed and a large number of buildings need to be generated. We propose a system using a procedural approach based on L-systems to model cities. From various image maps ...

**Keywords:** L-system, architecture, developmental models, modeling, software design, urban development

## 10 [The design and analysis of a cache architecture for texture mapping](#)

Ziyad S. Hakura, Anoop Gupta

May 1997 **ACM SIGARCH Computer Architecture News , Proceedings of the 24th annual international symposium on Computer architecture**, Volume 25 Issue 2


Full text available:  pdf(2.10 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The effectiveness of texture mapping in enhancing the realism of computer generated imagery has made support for real-time texture mapping a critical part of graphics pipelines. Despite a recent surge in interest in three-dimensional graphics from computer architects, high-quality high-speed texture mapping has so far been confined to costly hardware systems that use brute-force techniques to achieve high performance. One obstacle faced by designers of texture mapping systems is the requirement ...

### 11 Modeling the mighty maple

Jules Bloomenthal

July 1985 **ACM SIGGRAPH Computer Graphics , Proceedings of the 12th annual conference on Computer graphics and interactive techniques**, Volume 19 Issue 3

Full text available:  pdf(6.64 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

A method is presented for representing botanical trees, given three-dimensional points and connections. Limbs are modeled as generalized cylinders whose axes are space curves that interpolate the points. A free-form surface connects branching limbs. "Blobby" techniques are used to model the tree trunk as a series of non-circular cross sections. Bark is simulated with a bump map digitized from real world bark; leaves are textures mapped onto simple surfaces.

**Keywords:** blobby surface, bump map, generalized cylinder, interpolation, modeling, ramiform, space curve, spline, texture map

### 12 Making faces

Brian Guenter, Cindy Grimm, Daniel Wood, Henrique Malvar, Fredric Pighin


July 1998 **Proceedings of the 25th annual conference on Computer graphics and interactive techniques**

Full text available:  pdf(1.70 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

### 13 Anisotropic reflection models

James T. Kajiya

July 1985 **ACM SIGGRAPH Computer Graphics , Proceedings of the 12th annual conference on Computer graphics and interactive techniques**, Volume 19 Issue 3

Full text available:  pdf(1.65 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present a new set of lighting models derived from the questions of electromagnetism. These models describe the reflection and refraction of light from surfaces which exhibit anisotropy---surfaces with preferred directions. The model allows a new mapping technique, which we call *frame mapping*. We also discuss the general relationship between geometric models, surface mapping of all types, and lighting models in the context of rendering images with extreme complexity.

**Keywords:** computer graphics, frame mapping, lighting models, raster graphics, surface mapping, texture mapping

### 14 Navigating in unfamiliar geometric terrain

Avrim Blum, Prabhakar Raghavan, Baruch Schieber



January 1991 **Proceedings of the twenty-third annual ACM symposium on Theory of computing**

Full text available:  pdf(1.15 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#), [review](#)

### 15 Directional flow visualization of vector fields

Ed Boring, Alex Pang

October 1996 **Proceedings of the 7th conference on Visualization '96**

Full text available:  pdf(709.45 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)  
 [Publisher Site](#)

**Keywords:** clutter reduction, flow reversal, glyphs, hue, lighting, region selection, streamlines, value

#### 16 Grasping reality through illusion—interactive graphics serving science

F. P. Brooks

May 1988 **Proceedings of the SIGCHI conference on Human factors in computing systems**


Full text available:  pdf(1.27 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

I treat three related subjects: virtual-worlds research—the construction of real-time 3-D illusions by computer graphics; some observations about interfaces to virtual worlds; and the coming application of virtual-worlds techniques to the enhancement of scientific computing. We need to design generalized interfaces for visualizing, exploring, and steering scientific computations. Our interfaces must be direct-manipulation, not command-string; interactive, not batch; 3-D, no ...

#### 17 Texture mapping progressive meshes

Pedro V. Sander, John Snyder, Steven J. Gortler, Hugues Hoppe

August 2001 **Proceedings of the 28th annual conference on Computer graphics and interactive techniques**

Full text available:  pdf(5.18 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Given an arbitrary mesh, we present a method to construct a progressive mesh (PM) such that all meshes in the PM sequence share a common texture parametrization. Our method considers two important goals simultaneously. It minimizes texture stretch (small texture distances mapped onto large surface distances) to balance sampling rates over all locations and directions on the surface. It also minimizes texture deviation ("slippage" error based on parametric correspondence) to obtain ...

**Keywords:** mesh simplification, surface flattening, surface parametrization, texture stretch

#### 18 Modeling california earthquakes and earth structures

Michael R. Raugh

November 1985 **Communications of the ACM**, Volume 28 Issue 11


Full text available:  pdf(5.06 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Seismology has burgeoned into a modern science—force-fed by federal funding to advance technology for detecting underground nuclear explosions and predicting earthquakes, and by industry to improve tools for gas and oil exploration. Computers, seismic instrument systems, telemetry, and data reduction have played key roles in this growth.

#### 19 Ray tracing vs. scan conversion: The ray engine

Nathan A. Carr, Jesse D. Hall, John C. Hart

September 2002 **Proceedings of the ACM SIGGRAPH/EUROGRAPHICS conference on Graphics hardware**

Full text available:  pdf(1.88 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

[terms](#)

Assisted by recent advances in programmable graphics hardware, fast rasterization-based techniques have made significant progress in photorealistic rendering, but still only render a subset of the effects possible with ray tracing. We are closing this gap with the implementation of ray-triangle intersection as a pixel shader on existing hardware. This GPU ray-intersection implementation reconfigures the geometry engine into a ray engine that efficiently intersects caches of rays for a wide varie ...



**Keywords:** hardware acceleration, pixel shaders, ray caching, ray classification, ray coherence, ray tracing

## 20 [Simplifying polygonal models using successive mappings](#)

Jonathan Cohen, Dinesh Manocha, Marc Olano

October 1997 **Proceedings of the 8th conference on Visualization '97**

Full text available:

 pdf(1.25 MB)   
[Publisher Site](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

**Keywords:** levels-of-detail, linear programming, model simplification, projection, surface approximation

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